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EXAMINER	
GARCIA OTERO, EDUARDO	
ART UNIT	PAPER NUMBER
2123	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/531,633	LI, ZHE	
	Examiner	Art Unit	
	Eduardo Garcia-Otero	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 August 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION: Final Action.

Introduction

1. Title is: METHOD FOR CONDITIONAL TAUTOLOGY CHECKING
2. First named inventor is: LI.
3. Claims 1-20 have been submitted, examined, and rejected.
4. Priority is claimed to provisional application 60/125,835 filed 3/24/1999.
5. This action is in response to Applicant's Amendment received 8/4/2004.
6. This is a final action.

Index of Important Prior Art

7. **Simpson** refers to US Patent 5,642,304.
8. **Okuzawa** refers to US Patent 5,243,538.
9. **Tucker** refers to The Computer Science and Engineering Handbook, by Allen B. Tucker, CRC Press, ISBN: 0-8493-2909-4, 1996.

Applicant's Remarks

10. At Remarks page 13, Applicant asserts "adjacency theorem that is known to be dependent on representing the Boolean function as a truth table". This assertion does not appear fully accurate.
11. The prior office action paragraph 18 stated "Boolean minimization precisely groups the input space into convenient groups allowing simplified expression of the function. Applicant further asserts that the Karnough mapping techniques are only known as manual methods, and can show at most 4 or 5 Boolean variables. Karnough maps do have certain practical limitations as a manual method, because they can only show a maximum of 4 variables in a single contiguous 2-dimensional map. A fifth variable requires a second 2-dimensional map, and perhaps is the limit of usefulness for Karnough maps as a manual graphical method. However, the adjacency theorem, which Karnough mapping exploits, remains valid for any number of variables. While it is difficult for humans to graphically visualize and manually group more than 5 variables, the Karnough mapping algorithms (adjacency theorem) remains valid and is easily applied by computer to more than 5 variables."
12. Thus, the adjacency theorem does not appear to be dependent upon representing the Boolean function as a truth table (or as a Karnough map). Rather, the adjacency theorem appears

more fundamental, and appears directly dependent upon "adjacency" of the data in n dimensional space (where n is the number of variables). A Karnough map is a rather clever way of representing up to 4 variables graphically in a 2 dimensional space, in such a way that the adjacency theorem may be graphically applied.

13. In summary, the adjacency theorem does not appear to be dependent upon representing the Boolean function as a truth table, nor upon representing the Boolean function as a Karnough map.
14. At Remarks page 14-16, applicant discusses the poor scalabilities of Binary Decision Diagrams (BDDs), and that they may be unsuitable for verifying large designs if used alone.
15. Applicant does not address the "BOOLEAN EXPRESSION" portion of Okuzawa FIG 1.
16. Applicant has amended claim 1 to insert a negative limitation, excluding truth tables. The Examiner will amend the related rejections appropriately.
17. Claim 18 has been amended, and new claim 20 has been added. Amended and new rejections are presented below.

Claim Interpretation

18. In claim 1, the term **"complex Boolean function"** is interpreted as a Boolean function with 6 or more variables.
19. In claim 2, the term **"cube"** is defined at Specification page 6 as "A cube is the subset of the input space where some input variables are substituted with Boolean constant 1 and some other input variables are substituted with Boolean constant 0."
20. As discussed in prior actions, Applicant's definition is interpreted as equivalent to Simpson's definition at Column 13 line 28 (also see Simpson Table 2):
21. The definition of a cube is a boolean term in which each coordinate represents a variable of two values. The universe of n Boolean variables can be thought of as an n-dimensional space in which each coordinate represents a variable of two values, 0 or 1. Each lattice point, called a vertex, in this n-dimensional space represents a minterm, and a special collection of these minterns form an implicant, which is seen as a cube of vertices. The usual definition of a cube is an n-tuple vector of 0, 1 and X, where 0 means the complement value of the variable, 1 represents the true value, and X denotes either 0 or 1 or both values of the variable. A list of cubes

represents the union of the vertices covered by each cube and is called a cubical cover of the vertices, or simply a cover.

35 USC § 112-Second Paragraph-indefinite claims

22. The following is a quotation of the second paragraph of 35 U.S.C. 112: The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

23. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

24. In claim 20, the term ""said complex Boolean function involves significantly more than 100 variables" is indefinite. Specifically, it is not clear what "significantly more than 100" means. The scope and bounds are not well defined.

Claim Rejections - 35 USC § 103

25. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action: (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

26. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows: Determining the scope and contents of the prior art. Ascertaining the differences between the prior art and the claims at issue. Resolving the level of ordinary skill in the pertinent art. Considering objective evidence present in the application indicating obviousness or nonobviousness.

27. Claims 1-19 are rejected under 35 U.S.C. 103(a) as being unpatentable.

28. Claim 1 (currently amended) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

29. Claim 1 (currently amended) is an independent claim with 4 limitations.

30. A-**"receiving said complex Boolean function"** is disclosed by Okuzawa FIG 1 "BOOLEAN EXPRESSION" and "TRUTH TABLE".

31. B-**"receiving said Boolean constant"** is disclosed by Okuzawa FIG 1 "BOOLEAN EXPRESSION" and "TRUTH TABLE"..
32. C-**"receiving said given subset of the input space"** is disclosed by Okuzawa FIG 1 "BOOLEAN EXPRESSION" and "TRUTH TABLE"..
33. D(part two)-"[dividing said given subset of the input space into a set of a plurality of smaller subsets of the input space,] **whereby the equivalence is determined positive if said complex Boolean function is equivalent to said Boolean constant within every member of said set of a plurality of smaller subsets of the input space"** is disclosed by Okuzawa at FIG 1 "COMPARISON".
34. D(part three)- "[dividing said given subset of the input space into a set of a plurality of smaller subsets of the input space, whereby the equivalence is determined positive if said complex Boolean function is equivalent to said Boolean constant within every member of said set of a plurality of smaller subsets of the input space] **without representing said complex Boolen function as any Binary Decision Diagram"** is disclosed by Okuzawa at FIG 1 "COMPARISON" and "BOOLEAN EXPRESSION".
35. Okuzawa does not expressly disclose the remaining limitation.
36. B(part one)-**"dividing said given subset of the input space into a set of a plurality of smaller subsets of the input space"** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and MPEP 2144.04(VI)(B) *In re Harza* (legal precedent for duplication), 274 F.2d 669, 124 USPQ 378, 380 (CCPA 1960) which states "It is well settled that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced". See MPEP 2144.04(VI)(B). In this claim, duplicating the part does not produce any new result and does not produce any unexpected result. Note dividing the single given subset of input space into multiple smaller subsets (duplicating the part) does not produce any new and unexpected result. Also see MPEP 2144.04(IV)(A) regarding changes in size and proportion.

37. **At the time** the invention was made, it would have been obvious to a person of ordinary skill in the art to use Tucker and MPEP 2144.04(VI)(B) to modify Okuzawa. One of ordinary skill in the art would have been motivated to do this to simplify the equivalence comparison by comparing a single logical expression at a time (Tucker) or a single input point at a time (MPEP 2144.04(VI)(B)), and thus to reduce the resources required (such as RAM) to perform the equivalence comparison, and/or to speed calculations by allowing parallel processing of smaller subsets.
38. Claim 2 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and Simpson.
39. Claim 2 depends from claim 1, with two additional limitations.
40. B-**simplifying, if said given subset of the input space is a cube, said complex Boolean function with substituting the input variables in said complex Boolean function with Boolean constants according to the substitution requirements provided by said cube, whereby the conclusion is positive if the simplification result is said Boolean constant, and the conclusion is negative if the simplification result is a Boolean constant other than said Boolean constant** is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and "COMPARISON".
41. Okuzawa does not expressly disclose the remaining limitation.
42. A-**determining whether said given subset of the input space is a cube** is disclosed by Simpson Column 13 line 28 "cube".
43. Claim 3 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and Simpson.
44. Claim 3 depends from claim 2, with one additional limitation.
45. **"replacing said complex Boolean function with the simplification result of the simplifying step before the dividing step, whereby the simplification result is used as said complex Boolean function in all later steps"** is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and "COMPARISON".

46. Claim 4 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.
47. Claim 4 depends from claim 1, with one additional limitation.
48. **"a member of said set of a plurality of smaller subsets of the input space is a cube within said given subset of the input space, whereby it is possible to substitute the input variables in said complex Boolean function with Boolean constants according to the substitution requirements provided by of said cube"** is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and "COMPARISON".
49. Claim 5 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.
50. Claim 5 depends from claim 4, with one additional limitation.
51. **"simplifying said complex Boolean function with substituting the input variables in said complex Boolean function with Boolean constants according to the substitution requirements provided by said cube, whereby the conclusion is positive if the simplification result is said Boolean constant, and the conclusion is negative if the simplification result is the Boolean constant other than said Boolean constant"** is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and "COMPARISON".
52. Claim 6 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.
53. Claim 6 depends from claim 5, with one additional limitation.
54. **"repeating the dividing step and the simplifying step if the simplification result is not a Boolean constant, whereby said cube is smaller and the simplification result will eventually be a Boolean constant when said cube is small enough"** is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and "COMPARISON".
55. Claim 7 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.
56. Claim 7 depends from claim 4, with one additional limitation.
57. **"said given subset of the input space is represented as a first range of binary integer"** is disclosed by Okuzawa FIG 1 "LOGIC CIRCUIT TRUTH TABLE BOOLEAN EXPRESSION".

58. Claim 8 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.
59. Claim 8 depends from claim 7, with one additional limitation.
60. Okuzawa does not expressly disclose the remaining limitation.
61. **"said set of a plurality of smaller subsets of the input space has only two members; said cube which is represented as a second range of binary integers, and a second member which is represented as a third range of binary integers, whereby said third range of binary integers is divided repeatedly into cubes and such divisions do not need to all complete if the negative conclusion is given for any of these cubes"** is disclosed by is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and MPEP 2144.04(VI)(B) *In re Harza* (legal precedent for duplication), 274 F.2d 669, 124 USPQ 378, 380 (CCPA 1960) which states "It is well settled that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced". See MPEP 2144.04(VI)(B). In this claim, duplicating the part does not produce any new result and does not produce any unexpected result. Note dividing the single given subset of input space into multiple smaller subsets (duplicating the part) does not produce any new and unexpected result.
62. Claim 9 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and further in view of MPEP 2144.04(IV)(A) legal precedent for changing size/proportion.
63. Claim 9 depends from claim 8, with one additional limitation.
64. Okuzawa does not expressly disclose the remaining limitation.
65. **"replacing said given subset of the input space, represented as said first range of binary integers, with said second member of said set of a plurality of smaller subsets of the input space, represented as said third range of binary integers, after finishing all steps related to said cube and said second range of binary integers which represents said cube, whereby said given subset of the input space become smaller and smaller and**

whether said complex Boolean function is equivalent to said Boolean constant within said given subset of the input space can be determined using simplification when said subset of the input space eventually becomes a cube" is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and is disclosed by 2144.04(IV)(A) legal precedent for changing size/proportion. *In re Rinehart*, 531 F.2d 1048, 1953, 189 USPQ 143, 148 (CCPA 1976) states "mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled". Similarly, merely shifting the regions of the input space being considered would not establish patentability.

66. Claim 10 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and further in view of MPEP 2144.04(IV)(A) legal precedent for changing size/proportion.
67. Claim 10 depends from claim 9, with one additional limitation.
68. Okuzawa does not expressly disclose the remaining limitation.
69. **"shifting a boundary of said third range of binary integers before the replacing step if the corresponding boundary of said first range of binary integers is shifted, whereby a boundary of said first range of binary integers can shift dynamically"** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and is disclosed by 2144.04(IV)(A) legal precedent for changing size/proportion. *In re Rinehart*, 531 F.2d 1048, 1953, 189 USPQ 143, 148 (CCPA 1976) states "mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled". Similarly, merely shifting a boundary of the input space being considered would not establish patentability.

70. Claim 11 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.
71. Claim 11 depends from claim 4, with one additional limitation.
72. **"substituting the input variables in said complex Boolean function with Boolean constants according to the substitution requirements provided by said cube, whereby any tautology checking method can be used to process the complex Boolean function resulted from the substitution"** is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and "COMPARISON".
73. Claim 12 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.
74. Claim 12 depends from claim 11, with one additional limitation.
75. **"said given subset of the input space is represented as a first range of binary integers"** is disclosed by Okuzawa FIG 1 "LOGIC CIRCUIT TRUTH TABLE BOOLEAN EXPRESSION".
76. Claim 13 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and further in view of MPEP 2144.04(IV)(A) legal precedent for changing size/proportion.
77. Claim 13 depends from claim 12, with one additional limitation.
78. Okuzawa does not expressly disclose the remaining limitation.
79. **"said set of a plurality of smaller subsets of the input space has only two members: said cube which is represented as a second range of binary integers, and a second member which is represented as a third range of binary integers, whereby said third range of binary integers is divided repeatedly into cubes and such divisions do not need to all complete if the negative conclusion is given for any of these cubes"** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and is disclosed by 2144.04(IV)(A) legal precedent for changing size/proportion. *In re Rinehart*, 531 F.2d 1048, 1953, 189 USPQ 143, 148 (CCPA 1976)

states "mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled". Similarly, merely changing the size of the input space being considered would not establish patentability.

80. Claim 14 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and further in view of MPEP 2144.04(IV)(A) legal precedent for changing size/proportion.
81. Claim 14 (currently amended) depends from claim 13, with one additional limitation.
82. Okuzawa does not expressly disclose the remaining limitation.
83. **"replacing said given subset of the input space, represented as said first range of binary integers, with said second member of said set of a plurality of smaller subsets of the input space, represented as said third range of binary integers, after finishing all steps related to said cube and said second range of binary integers which represent said cube, whereby said given subset of the input space become smaller and smaller and whether said complex Boolean function is equivalent to said Boolean constant within said given subset of the input space can be determined using simplification when said given subset of the input space eventually becomes a cube"** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and is disclosed by 2144.04(IV)(A) legal precedent for changing size/proportion. *In re Rinehart*, 531 F.2d 1048, 1953, 189 USPQ 143, 148 (CCPA 1976) states "mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled". Similarly, merely shifting the boundaries of the input space being considered would not establish patentability.
84. Claim 15 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and further in view of MPEP 2144.04(IV)(A) legal precedent for changing size/proportion.
85. Claim 15 depends from claim 14, with one additional limitation.

86. Okuzawa does not expressly disclose the remaining limitation.

87. **"shifting a boundary of said third range of binary integers before the replacing step if the corresponding boundary of said first range of binary integers is shifted, whereby a boundary of said first range of binary integers can shift dynamically"** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and is disclosed by 2144.04(IV)(A) legal precedent for changing size/proportion. *In re Rinehart*, 531 F.2d 1048, 1953, 189 USPQ 143, 148 (CCPA 1976) states "mere scaling up of a prior art process capable of being scaled up, if such were the case, would not establish patentability in a claim to an old process so scaled". Similarly, merely shifting the boundaries of the input space being considered would not establish patentability.

88. Claim 16 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication, and Simpson.

89. Claim 16 depends from claim 1, with two additional limitations.

90. B-**"substituting, if said given subset of the input space is a cube, the input variables in said complex Boolean function with Boolean constants according to the substitution requirements provided by said cube, whereby any tautology checking can be used to process the Boolean function resulted from the substitution"** is disclosed by Okuzawa FIG 1 "SIMPLIFICATION" and "COMPARISON".

91. Okuzawa does not expressly disclose the remaining limitation.

92. A-**"determining whether said given subset of the input space is a cube"** is disclosed by Simpson Column 13 line 28 "cube".

93. Claim 17 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

94. Claim 17 depends from claim 1, with one additional limitation.

95. Okuzawa does not expressly disclose the remaining limitation.

96. **"starting a process for each member of said set of a plurality of smaller subsets of the input space determining whether said complex Boolean function is equivalent to said Boolean constant within said member of said set of a plurality of smaller subsets of the input space, whereby these processes can run on the same computer or on several computers, at the same time or at different times"** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and is disclosed by MPEP 2144.04(VI)(B) *In re Harza* (legal precedent for duplication), 274 F.2d 669, 124 USPQ 378, 380 (CCPA 1960) which states "It is well settled that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced". In this claim, duplicating the part does not produce any new result and does not produce any unexpected result. Note dividing the single given subset of input space into multiple smaller subsets (duplicating the part) does not produce any new and unexpected result. Also see MPEP 2144.04(IV)(A) regarding changes in size and proportion.
97. Claim 18 (currently amended) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.
98. Claim 18 depends from claim 1, with one additional limitation.
99. **"said compex Boolean function is represented as a netlist, whereby a high capacity is achieved by avoiding any Binary Decision Diagrams"** is disclosed by Okuzawa FIG 1 and FIG 4A.
100. Claim 19 (previously presented) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.
101. Claim 19 (new) depends from claim 1, with one additional limitation.
102. **"said Boolean constant is 1, whereby the method checks a conditional tautology"** is disclosed by Okuzawa at FIG 1 "COMPARISON".
103. Claim 20 (new) is rejected under 35 U.S.C. 103(a) as being unpatentable over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.
104. Claim 20 (new) depends from claim 1, with one additional limitation.

105. **"said complex Boolean function involves significantly more than 100 variables"** is disclosed by Tucker at page 287 "A divide-and-conquer" algorithm first splits the problem to be solved into subproblems that are easier to solve than the original problem either because they are smaller instances of the original problem, or because they are different but easier problems", and Tucker page 2034 "Parallel Functional Programming... determining the appropriate granularity", and is disclosed by MPEP 2144.04(VI)(B) *In re Harza* (legal precedent for duplication), 274 F.2d 669, 124 USPQ 378, 380 (CCPA 1960) which states "It is well settled that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced". In this claim, duplicating the part does not produce any new result and does not produce any unexpected result. Note dividing the single given subset of input space into multiple smaller subsets (duplicating the part) does not produce any new and unexpected result. Also see MPEP 2144.04(IV)(A) regarding changes in size and proportion.

MOTIVATION FOR CLAIMS 2-20

106. At the time the invention was made, one of ordinary skill would have begun with Okuzawa FIG 1 for verification by simplification and comparison. One of ordinary skill would then turn to Simpson for the basic Boolean "cube" system in order to clearly define the possible input space for purposes of subdividing the problem. One of ordinary skill would then turn to Tucker or to legal precedents from MPEP 2144.04(VI)(B) and MPEP 2144.04(IV)(A) to divide the input space into multiple regions and/or into smaller regions. One of ordinary skill in the art would have been motivated to do this to simplify the equivalence comparison by comparing a small regions at a time, and/or to reduce the resources required (such as RAM) to perform the equivalence comparison, and/or to speed calculations by allowing parallel processing of smaller subsets.

Conclusion

107. All claims stand rejected.

Communication

108. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo Garcia-Otero whose telephone number is 703-305-0857. The examiner can normally be reached on Tuesday through Friday from 9:00 AM to

8:00 PM. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kevin Teska, can be reached at (703) 305-9704. The fax phone number for this group is 703-872-9306. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the group receptionist, whose telephone number is (703) 305-3900.

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